International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
www.chemijournal.com
IJCS 2020; 8(6): 267-269

Received: 22-08-2020
Accepted: 20-10-2020

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# Root growth, leaf area, fresh and dry weight of mango seedlings influence by foliar spray of growth substances

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**DOI:** https://doi.org/10.22271/chemi.2020.v8.i6d.10781

**Abstract**
The present investigation was carried out at Regional Horticultural Research Station, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari during 2019-2020. An experiment consisted of thirteen treatments *viz.*, $GA_3$ (100 and 200 mg $l^{-1}$), BA (50 and 100 mg $l^{-1}$), NAA (50 and 100 mg $l^{-1}$), Novel organic liquid nutrients (1 and 2%), Sea weed extract (1 and 2%), Urea (0.5 and 1%) and control. Above growth substances applied thrice at 3rd, 4th and 5th months after sowing of mango stones. The experiment was laid out in Completely Randomized Design (CRD) and repeated thrice. The results of present investigation revealed that, there was a significant difference on growth of mango seedling due to foliar spray of growth substances at 3rd, 4th and 5th months after sowing of mango stones. Among the different treatments, the maximum the length of the longest root at 8th MAS (52.67 cm), girth of the longest root (2.35 mm), fresh and dry weight of mango seedling (52.97 and 15.67 g, respectively) were recorded in $GA_3$ @ 200 mg $l^{-1}$ treatment. While, maximum number of roots at 8th MAS (7.47) was noted in BA @ 100 mg $l^{-1}$ treatment. Foliar application of NAA @ 100 mg $l^{-1}$ on mango seedling recorded maximum leaf area at 4th, 5th, 6th, 7th and 8th MAS (56.79, 58.42, 60.62, 62.66 and 65.22 $cm^2$, respectively). While, all the growth characters of mango seedlings were recorded significantly minimum in control.

**Keywords:** $GA_3$, BA, NAA, novel organic liquid nutrients, sea weed extract, urea

## Introduction
Mostly, mangoes are vegetatively propagated by inarching, veneer grafting, epicotyl grafting, softwood grafting, *etc*. For that it is essential to raise the seedlings to be used as rootstocks for grafting. Rootstocks are always seedling origin irrespective of nucellar in nature. The present day nursery practices involve high cost and risk with respect to raising of seedling rootstocks and their later maintenance till they reach the graftable size.

Healthy growth of rootstock is mainly important in attaining the higher rate of grafting success. In the nursery activities, the preparation of media and make use of growth substances should receive the considerable attention of the nursery man and growers for improving the germination and successive growth of seedlings.

## Material and Methods
The present investigation was carried out at Regional Horticultural Research Station, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari during 2019-20. An experiment consisted of thirteen treatments *viz.*, $GA_3$ @ 100 mg $l^{-1}$ ($T_1$), $GA_3$ @ 200 mg $l^{-1}$($T_2$), BA @ 50 mg $l^{-1}$($T_3$), BA @ 100 mg $l^{-1}$($T_4$), NAA@ 50 mg $l^{-1}$($T_5$), NAA @ 100 mg $l^{-1}$($T_6$), Novel organic liquid nutrients @1%($T_7$), Novel organic liquid nutrients @2%($T_8$), Sea weed extract @1% ($T_9$), Sea weed extract @2% ($T_{10}$), Urea @ 0.5% ($T_{11}$), Urea@1%($T_{12}$) and control ($T_{13}$). Above growth substances applied thrice at 3rd, 4th and 5th months after sowing of mango stones.

The experiment was laid out in Completely Randomized Design (CRD) and repeated thrice. The effect of these treatments on leaf area ($cm^2$), length of the longest root, number of roots, girth of the longest root, fresh and dry weight of mango seedling were studied.

## Results and Discussion

### Leaf area ($cm^2$)

It is clear from the data presented in Table 1 that maximum leaf area of mango seedling was significantly affected by foliar spray of growth substances. Significantly maximum leaf area of mango seedling at 4th, 5th, 6th, 7th and 8th MAS (56.79, 58.42, 60.62, 62.66 and 65.22 $cm^2$, respectively) recorded under the NAA @ 100 mg $l^{-1}$ treatment ($T_6$). The increased growth may be due to growth promoting activities of auxin in plant through RNA and protein synthesis and photosynthetic rate (Phinney *et al.,* 1957) [5] cell elongation as well as cell division and increased cell wall plasticity (Tagaw and Bonner, 1957) [6]. The maximum leaf area might be due increase in leaf length and width, which ultimately increased in leaf area of the plant.

### Length (cm) and Girth (mm) of the longest root

The differences for the length and girth of the longest root were significant due to foliar application of growth substances (Table 1). Significantly maximum length and girth of the longest root of mango seedling at 8th MAS (52.67 cm and 2.35 mm, respectively) noted in $GA_3$ @ 200 mg $l^{-1}$ treatment ($T_2$). This may be due to fact that $GA_3$ increases the somatic uptake of nutrients, causing root cell elongation and increasing the root volume and tap root length (Tagaw and Bonner, 1957) [6].

### Number of roots per seedling

In the present study, it was observed that foliar spray of growth substances had profound influence on number of roots (Table 1). Plants treated with BA @ 100 mg $l^{-1}$ ($T_4$) exhibited significantly maximum (7.47) number of roots. Increase in number of roots might be due to cytokinin promotes protein synthesis, increasing cell division and enlargement (Cheema and Sharma, 1982) [1].

### Fresh and Dry weight of mango seedling (g)

The data on fresh and dry weight of mango seedling presented in Table 1 significantly differed due to foliar spray of growth substances. It is evident from the study that the maximum fresh and dry weight at 8th MAS (52.97 and 23.33 g, respectively) was recorded in the $GA_3$ @ 200 mg $l^{-1}$ treatment ($T_2$).

Maximum fresh weight and dry weight of seedling might be due to effect of $GA_3$ by mobilization of water and nutrients transported at higher rate which might have promoted more production of photosynthetic product and translocated them to various plant parts which might have resulted in better growth of seedlings and hence more fresh weight and dry weight. A possible reason for this might be due to overall growth of the seedling and increased rate of photosynthesis that lead to the overall assimilation and redistribution of photosynthates within the seedling and hence, resulted in higher fresh and dry weight and total biomass.

Thus, increased growth is a consequence of increased dry matter accumulation (Joshi *et al.,* 2017) [2]. Similar findings were supported by Muralidhara *et al.* (2014) [3] in mango and Patil (2017) [4] in jamun.

**Table 1:** Effect of foliar spray of growth substances on leaf area, root growth, fresh and dry weight of mango seedling

| Treatments | Leaf area ($cm^2$) | | | | | Length of the longest root (cm) | Girth of the longest root (mm) | Number of roots per seedling | Fresh weight of mango seedling (g) | Dry weight of mango seedling (g) |
|---|---|---|---|---|---|---|---|---|---|---|
| | 4th MAS | 5th MAS | 6th MAS | 7th MAS | 8th MAS | | | | | |
| $T_1$ | 44.41 | 48.45 | 49.82 | 52.78 | 55.32 | 50.45 | 2.34 | 5.73 | 50.60 | 21.83 |
| $T_2$ | 46.69 | 48.81 | 51.27 | 54.88 | 56.57 | 52.67 | 2.35 | 6.40 | 52.97 | 23.33 |
| $T_3$ | 41.06 | 42.97 | 45.08 | 46.75 | 48.84 | 40.50 | 2.03 | 7.20 | 49.57 | 19.90 |
| $T_4$ | 41.09 | 43.04 | 45.38 | 47.92 | 49.50 | 41.58 | 2.11 | 7.47 | 50.40 | 20.60 |
| $T_5$ | 46.88 | 53.15 | 54.89 | 56.77 | 58.65 | 45.56 | 2.22 | 5.47 | 46.83 | 18.33 |
| $T_6$ | 56.79 | 58.42 | 60.62 | 62.66 | 65.22 | 47.92 | 2.27 | 5.53 | 47.17 | 18.37 |
| $T_7$ | 43.81 | 45.27 | 46.86 | 48.98 | 51.07 | 42.90 | 2.17 | 4.80 | 44.27 | 17.83 |
| $T_8$ | 43.93 | 45.36 | 47.18 | 49.22 | 51.28 | 43.76 | 2.20 | 5.20 | 44.40 | 18.23 |
| $T_9$ | 41.38 | 43.83 | 45.99 | 48.01 | 49.64 | 40.14 | 1.86 | 4.67 | 43.60 | 16.97 |
| $T_{10}$ | 41.97 | 45.03 | 46.39 | 48.36 | 50.87 | 40.27 | 1.87 | 4.73 | 44.00 | 17.13 |
| $T_{11}$ | 37.16 | 39.34 | 40.77 | 42.63 | 44.64 | 35.03 | 1.84 | 4.60 | 47.90 | 18.63 |
| $T_{12}$ | 38.33 | 39.54 | 43.03 | 45.64 | 47.82 | 35.07 | 1.85 | 4.60 | 49.50 | 19.43 |
| $T_{13}$ | 36.93 | 38.27 | 40.52 | 42.36 | 44.55 | 32.57 | 1.67 | 4.60 | 39.60 | 15.67 |
| S.Em.± | 0.96 | 1.03 | 0.95 | 1.02 | 1.03 | 0.46 | 0.04 | 0.12 | 0.55 | 0.44 |
| C.D. @ 5% | 2.80 | 3.00 | 2.75 | 2.97 | 3.00 | 1.34 | 0.13 | 0.34 | 1.60 | 1.27 |
| C.V. % | 3.87 | 3.93 | 3.45 | 3.56 | 3.44 | 1.89 | 3.80 | 3.66 | 2.03 | 4.00 |

## Conclusion

Based on the results of the present investigation, it can be concluded that, foliar application of $GA_3$ @ 200 mg $l^{-1}$ at 3rd, 4th and 5th months after sowing of mango stones resulted maximum growth of mango seedling in respect length and girth of the longest root and fresh and dry weight of mango seedling. Whereas, maximum leaf area of mango seedling was observed in NAA @ 100 mg $l^{-1}$ treatment.

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